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EXAMINER

RUTZ, JARED IAN

ART UNIT PAPER NUMBER

2187

DATE MAILED: 10/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/786,108	KANEDA ET AL.	
	Examiner	Art Unit	
	Jared I. Rutz	2187	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) 17 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 and 18-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>10172005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-16 and 18-25 are pending in the instant application, claim 17 having been withdrawn in the instant amendment dated 10/4/2005. Of these, there are 6 independent claims and 18 dependent claims. Applicant's amendments and arguments filed 10/4/2005 have been fully considered by the examiner, however they are not persuasive. Accordingly, this action is made **FINAL**.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on 10/4/2005 is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 112

3. The amendments to the claims are sufficient to overcome the rejection of claims 8 and 19-23 under USC 112 first paragraph and claims 8-14 and 19-23 under USC 112 second paragraph. Accordingly, these rejections have been withdrawn.

Claim Rejections - 35 USC § 101

4. The amendments to claim 9 are sufficient to overcome the rejection under USC 101. Accordingly this rejection has been withdrawn.

Claim Rejections - 35 USC § 102

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
6. **Claim 1-5, 9, 15, 18 and 24** are rejected under 35 U.S.C. 102(b) as being anticipated by Clifton et al (US 4,310,883).
7. **Claim 1** is taught by Clifton as:
 - a. A computer system comprising a computer, a plurality of storage units each containing one or more volumes for storing data used by the computer. See column 1 line 63 to column 2 line 4, which shows that data is stored both on DASD and data cartridges. See also column 1 lines 46-55, which show that pairs of data on the cartridges are referred to as volumes.
 - b. And a management computer for managing the status of the plurality of storage units. See figure 1 item 18, which shows the mass storage controller.
 - c. One or more first-level storage units each containing one or more volumes for storing data used by the computer. See column 1 line 63 to column 2 line 4 which, shows the use of DASD to form a first level of storage.
 - d. One or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-storage units and contains one or more volumes for storing data used by the computer, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said

one or more first-level storage units. See column 1 line 62 to column 2 line 8, which shows that the mass storage facility is the second-level storage units. It goes on to explain that volumes stored in the second-level storage are transferred to the DASD storage in a process called staging, which creates a hierarchical relationship. As the data is moved between the second and first level storage, it is inherent that they are connected by a communication path. *The volumes held in the second-level storage units are available for use as a volume in one of the first-level storage units. By transferring the data from the second level storage units to a first level storage unit, the volumes are able to then be used as a volume in the first level storage unit. The first level storage units are used in a manner similar to a cache for the second level storage units, which is well known to be a hierarchical memory structure. Additionally, the examiner directs Applicant to column 1 line 63-64 which states "The mass storage system is a hierarchical system in which data is available at one of three levels." See also column 2 lines 54-65 that shows that the mass storage system appears to the host computer as a plurality of disk drives directly available to the host.*

e. Volume information collecting means for collecting information on the volumes contained in the first-level and the second-level storage units. See column 2 lines 34-38, which show that the mass storage controller finds the requested data in the second-level storage and finds space in the first-level storage. The mass storage controller provides the volume information collecting

means (See column 9 lines 45-52). See also column 1 lines 21-22, which states that storage management entails monitoring space usage.

f. Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes contained in the first-level storage and the second-level storage units, said information on the hierarchical relationships identifying which volumes of said second-level storage units and said first-level storage units are hierarchically linked together. See column 1 lines 25-27, which states that the prime purpose of the mass storage system is the management of the storage hierarchy. The mass storage controller provides the hierarchical information collecting means, as it controls the staging and destaging operations, which create the hierarchical relationships (column 8 lines 45-46). *See column 12 lines 58-60, which shows that the serial number of the cartridges in the library are associated with the volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table.*

g. Effective capacity calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on the volume information and the hierarchical information thus collected. See column 1 lines 41-45, which state that the space of the mass storage system volume space is monitored, and also column 1 lines 21-22, which states that storage management entails monitoring space usage. See again column 1 lines 63-64, which state that the mass storage system is the hierarchical system

including the DASD and the tape library, and also column 1 lines 21-22. In order to monitor the capacity of the system, it is inherent that the mass storage controller is able to calculate the effective capacity. *Column 1 lines 41-45 state that the space management is further enhanced by the monitoring of the mass storage system volume space status.*

8. **Claim 2** is taught by Clifton as:

h. Wherein the first-level storage units and the second-level storage units each contain one or more virtual storage areas as volumes. See column 2 lines 54-65, which show that the storage levels contain virtual volumes.

i. And the management computer comprises the volume information collecting means, the hierarchical information collecting means, and the effective capacity calculating means. See column 5 lines 47-50, which state that the procedures of the invention are initiated and monitored by programs on the system which controls the selection of a mass storage virtual volume. As shown above, these means are provided by the mass storage controller

9. **Claim 3** is taught by Clifton as:

j. Wherein each of the first-level storage units comprises means for storing the information on the hierarchical relationships between volumes contained therein and volumes contained in the second-level storage units. See column 8 lines 28-34, which states that the storage director, a control unit of the mass storage controller (see column 8 lines 24-26), maintains tables showing the location of all the virtual volumes. See further column 11 lines 56-64, which

show that these tables are referred to as mass storage volume inventory (MSVI).

The MSVI is stored in the DASD units (illustrated as item 28 of figure 3). See *column 12 lines 58-60, which shows that the serial number of the cartridges in the library are associated with the volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table.*

10. **Claim 4** is taught by Clifton as:

k. Wherein the information collected by the volume information collecting means includes at least an identifier and information on the capacity of each volume contained in the first-level and the second-level storage units, each said identifier being formatted according to an identifier format provided by said management computer. Figure 5 shows the data stored in the MSVI. Column 12 lines 38-40 show that the record identification is stored. Column 12 lines 65-67 show that the storage of information about the space in the volume is stored.

11. **Claim 5** is taught by Clifton as:

l. Wherein the information collected by the hierarchical information collecting means includes information indicating the relationship between an identifier of each volume contained in the first-level storage units and an identifier of its corresponding hierarchically-linked volume contained in the second-level storage unit. Column 12 lines 58-60 show that the number of the cartridges in the library that are associated with the volume. See *column 12 lines 58-60, which shows that the serial number of the cartridges in the library are associated with the*

volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table.

12. **Claim 9** is taught by Clifton as:

- m. A management computer for managing the status of storage units containing volumes for storing data used by a computer. This is taught by the mass storage controller as shown with respect to claim 1.
- n. Comprising volume information collecting means for collecting information on the volumes from one or more first-level storage units containing volumes for storing data used by the computer and from one or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-level storage units and contains at least one volume for storing data used by the computer, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said one or more first-level storage units. This structure had been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.
- o. Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes in the first-level storage units and volumes in the second-level storage units, said information on hierarchical relationships identifying which volumes of said second-level storage units and first-level storage units are hierarchically linked together. This structure had

been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.

p. Effective capacity calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on the volume information and the hierarchical information thus collected. This structure had been shown with respect to claim 1, and claim 2 shows that it is performed by a program executing on the mass storage controller.

13. **Claim 15** is taught by Clifton as:

q. A management method for managing, using a management computer, capacities of volumes storing data used by a computer, comprising the steps of: providing a volume in a first storage unit for storing data used by the computer. See column 1 line 63 to column 2 line 4 which, shows the use of DASD to form a first level of storage.

r. Establishing a hierarchical relationship between the first storage unit and a second storage unit that allows a volume in said second storage unit to be made available for use as a volume in said first storage unit. See column 1 line 62 to column 2 line 8, which shows that the mass storage facility is the second-level storage units. It goes on to explain that volumes stored in the second-level storage are transferred to the DASD storage in a process called staging, which creates a hierarchical relationship.

s. Collecting from the first storage unit information on the volumes contained therein, and collecting from the second storage unit information on the volumes

contained therein. Collecting information on the hierarchical relationships between the volumes contained in the first storage unit and the volumes contained in the second storage unit, said information on the hierarchical relationships identifying which volumes of said second storage unit and said first storage unit are hierarchically linked together. See column 24 lines 17-23, which show that the information on the volumes is requested when the host CPU requests a storage area. The mass storage controller examines the information describing the volume, which is not the data stored in the MSVI register.

t. Calculating the total effective capacity of the volumes of the first and second storage units based on the information on the volumes and the information on the hierarchical relationships. See column 25 lines 35-40, which show that the capacity of the volume is checked.

14. **Claim 18** is taught by Clifton as:

u. A storage medium on which is stored a program designed to run on a management computer for managing the storage capacities of storage units containing volumes for storing data used by a computer, the program when executed causing the management computer to perform a method comprising the steps of collecting from a first storage unit information on the volumes contained therein for storing data used by the computer.

v. Collecting from a second storage unit, having a hierarchical relationship with the first storage unit, information on the volume contained therein.

- w. Collecting information on the hierarchical relationships between the volumes contained in the first storage unit and the volumes contained in the second storage unit, said information on the hierarchical relationships identifying which volumes of said second storage unit and said first storage unit are hierarchically linked, said second storage unit has a volume that is available for use as a volume in said first storage unit.
 - x. And calculating the total effective capacity of the volumes of the first and second storage units based on the information on the volumes and the information on the hierarchical relationships thus collected.
 - y. See column 5 lines 47-50, which state that the procedures of the invention are initiated and monitored by programs on the system which controls the selection of a mass storage virtual volume. The mass storage controller provides the means for collecting data from the first and second storage units, means for collecting information on the hierarchical relationships, and means for calculating the total effective capacity as shown with respect to claim 9 above.
15. **Claim 24** is taught by Clifton as:
- z. A management computer for managing the status of storage units containing volumes for storing data used by a computer, comprising a CPU and a network interface unit connected by a management network, (the primary host CPU, figure 1 item 20, and its I/O controller, item 24).
 - aa. Wherein the CPU collects information on the volumes from one or more first level storage units containing volumes for storing data used by the computer

and from one or more second level storage units each of which is connected through a communication path to, and hierarchically linked to one of the first level storage units and contains at least one volume for storing data used by the computer, and information on the hierarchical relationships between volumes in the first level storage units and volumes in the second level storage units via said network interface, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said one or more first-level storage units, and wherein said information on the hierarchical relationships identifies which volumes of said second-level storage units and said first-level storage units are hierarchically linked together. These actions have been shown to be performed by the mass storage controller, which in column 7 lines 32-36 is shown to be under the control of the primary host CPU.

bb. And calculates the total effective capacity of the volumes of the first-level and second-level storage units based on the volume information and the hierarchy information thus collected. As shown above, this is performed by the mass storage controller, which is under the control of the primary host CPU.

Claim Rejections - 35 USC § 103

16. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

17. **Claims 6-7, 10-14, 16, 22, and 25** are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited supra) in view of Prahlad et al (US 2004/0250033).

18. With respect to claims 6-7, 10-14, and 25, Clifton discloses a storage management method and apparatus for a hierarchically arranged storage system. Clifton does not expressly disclose the use of a display or graphical user interface to interact with the storage management system.

19. Prahlad discloses the use of a graphical user interface for viewing and managing a storage device having data volumes with a hierarchical relationship.

20. Clifton and Prahlad are analogous art as they are from the same field of endeavor, namely the design and management of storage systems having hierarchical relationships. At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Clifton and Prahlad before them, to use a display system similar to that of Prahlad to visualize and interact with the storage management system. The motivation for doing so would be to create an easy to use method for controlling the grouping of volumes (Clifton column 11 lines 27-30). It is well known in the art of computing to use a graphical user interface to view and control aspects of storage devices. Therefore it would have been obvious to combine a graphical user interface such as the one taught by Prahlad to monitor and control the storage system of Clifton to obtain the invention as specified in claims 6-7, 10-14, and 25.

21. **Claim 6, 10, 16** are taught by Prahlad as:

cc. Wherein the management computer comprises a display for displaying the information collected by the volume information collecting means and the result of the calculation made by the effective capacity calculating means. See

paragraph 0076 which discusses the user interface screen, and lines 23-25 of the same paragraph, which shows that information such as association and capacity may be displayed.

22. **Claim 7, 12** is taught by Prahlad as:

dd. Wherein the management computer comprises a display that has a first display section for displaying the volume information of the volumes contained in the second level storage units that are hierarchically linked to volumes contained in the first level storage units, and a second display section for displaying the volume information of other volumes. See figure 6 item 610 which shows the snapshots being shown in a separate folder from the other information in the system.

23. **Claim 11** is taught by Prahlad as:

ee. Further comprising a display for displaying information on the volumes in the first-level storages that are made available to the computer and an input device for inputting information on volumes. Paragraph 0076 shows a display of storage information in which specific objects may be selected.

ff. Wherein information on volumes is displayed on the display as objects, and when a specific object on the display is selected by the input device, the corresponding volume in the second level storage unit located through the hierarchical information will be identified, and the corresponding volume information obtained by the volume information collecting means from the

corresponding volume will be displayed on the display. See paragraph 0076 lines 18-25.

24. **Claim 13** is taught by Prahlad as:

gg. Further comprising a display for displaying as objects volume information of the volumes in the first-level storage units collected by the volume information collecting means. See paragraph 0076.

hh. Wherein a first object indicating that the volume in a first level storage unit is actually provided by a volume in a second level storage unit hierarchically linked thereto and a second object representing the volume in the second level storage unit that is actually provided as the volume in the first level storage unit hierarchically linked thereto are displayed on the display in such a way as to reflect the hierarchical relationship between them. Paragraph 0076 line 22-24 states that the association of a snapshot may be displayed.

25. **Claim 14** is taught by Prahlad as:

ii. Wherein on the display either a screen where information on volumes in the second level storage units that are hierarchically linked to volumes in the first level storage units is hidden or a screen showing information on volumes in the second level storage units that are not used by the first level storage units is selectively displayed. Figure 7 shows the display being a window with features that allow the window to be selectively hidden or closed. Such behavior is well known in the art of using Microsoft Windows, or any of a number of graphical windowing environments.

26. **Claim 22** is taught by Prahlad as

jj. Wherein the screen of the display has a display section for displaying the identifier, capacity and associated icon of each volume of the first storage unit, and a display section for displaying the identifier, capacity, and associated icon of each volume of the second storage unit, and a display section for displaying the total available capacity. See Prahlad paragraph 0076 lines 18-25, which says that relevant details are shown. It is known to one of average skill in the art that identifiers (such as "c:" in a Windows system) and capacity are commonly shown in a browser window.

27. **Claim 25** is taught by Prahlad as:

kk. Further comprising a display for displaying the information collected and the result of the calculation by said CPU. See paragraph 0076.

28. **Claims 8, 19, and 20** are rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited supra) in view of Kusters et al (US 6,681,310).

29. With respect to claims 8, 19, and 20, Clifton discloses a method and apparatus for managing a hierarchical storage system as discussed above with respect to claims 1-5, 9, 15, 18 and 24. Clifton does not explicitly disclose a method or device for allowing the use of storage devices from different manufacturers.

30. Kusters discloses a storage management system with a volume manager that allows multiple storage devices from different manufacturers without the higher level system needing to know the specifics of each device.

31. Clifton and Kusters are analogous art because they are from the same field of endeavor, the design of data storage systems.

32. At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the system disclosed by Kusters to allow hardware having different lower level structures in the hierarchical storage system of Clifton.

33. The motivation for doing so would have been to allow the use of different types and manufacturers of storage units with the same application programming interface (Kusters column 2 lines 34-39), which makes the lower level details of the system more transparent to users allowing the entire storage system to appear to users as a plurality of disk drives all directly available to the host computer (Clifton column 2 lines 54-56).

34. **Claim 8** is taught by Kusters as:

II. Further comprising an identifier management computer for managing the formats of identifiers of the volumes of the first-level and second-level storage units. *Kusters column 8 lines 37-41 show that the common volume manager provides a globally unique identifier for each logical volume, storage device, and volume provider.*

mm. Wherein each of the first level and the second level storage units comprises means for inquiring the identifier format of the identifier management computer. *Kusters column 6 lines 57-63 shows that each storage device has a volume provider that may be implemented in the hardware of the storage device. The volumes translate between the API of the common volume manager and the vendor specific protocol of the underlying storage device. In order to do this the*

volume provider must get the format of the identifiers of the volumes. This volume provider serves as a means for inquiring the globally unique identifier of the common volume manager. Storage devices from different vendors have different methods for recovering from failures. In order for a storage device to recover from a failure and function in the system of Clifton in view of Kusters, it must be able to request the identifiers of volumes stored within.

nn. And means for composing the volume information and the hierarchical information in accordance with the identifier format held in the identifier management computer. The volume providers perform management tasks such as configuration and monitoring of the storage, and as such it would be obvious to use them to gather the information relating to the logical volume units stored on their physical storage device (Kusters column 7 lines 41-48).

35. **Claim 19** is taught by Kusters as:

oo. Further comprising an identifier management computer connected through the communication path to the first level storage units, the second level storage units, and the management computer. As the Common Volume Manager of Kusters allows the computer system to communicate with the storage devices, it is inherent that it is connected through the communication path.

pp. Wherein the identifier management computer stores in a memory located therein, and manages, identifiers for identifying volumes of the first level and the second level storage units in a standardized format. Kusters column 8 lines 37-

41 show that the common volume manager provides a globally unique identifier for each logical volume, storage device, and volume provider.

qq. And upon receiving a request for identifier format information from one of the first level or the second level storage units or the management computer retrieves the requested identifier format information from the memory and sends the requested identifier format information to the first level storage unit, the second level storage device or the management computer requesting it. Kusters column 8 lines 37-41 show that the common volume manager provides the globally unique identifier. This information is necessary for the management of logical units performed by the volume providers, and must be sent to them for them to perform their tasks.

36. **Claim 20** is taught by Kusters as:

rr. A step of registering in a memory, and managing, identifier format information for identifying volumes of the first level storage units and the second level storage units in a standardized format. Kusters column 8 lines 37-41 show that the common volume manager provides a globally unique identifier for each logical volume, storage device, and volume provider. It is inherent that this information must be stored in a memory.

ss. Wherein the management computer, when started up, retrieves the identifier format information from the memory, and, when collecting from the first level and the second level storage units information on the volumes contained therein and when collecting information on the hierarchical relationships

therebetween obtains the information thus collected based on the identifier format information. Kusters teaches a system that provides a uniform API for varying types of storage devices having differing characteristics. When a system is started, it loads from memory information on how to communicate with the devices available to it. As the storage system is attached to the management computer, it is inherent that it would load the information on how to communicate with the storage system. As the API provides a uniform method for communicating with the storage system, it is obvious that the data relating to the logical volumes would be based on that API.

37. **Claim 23** is rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton (cited supra) in view of Kusters (cited supra) as applied to claims 6-7, 10-14, and 25 above, and further in view of Prahlad (cited supra).

38. With respect to claim 23, Clifton teaches:

tt. In a computer system including one or more first level storage units each containing one or more volumes for storing data used by a computer. See Clifton column 1 line 63 to column 2 line 4, which shows that data is stored both on DASD and data cartridges. See also Clifton column 1 lines 46-55, which show that pairs of data on the cartridges are referred to as volumes.

uu. One or more second level storage units each of which is connected through a communication path to, and hierarchically linked to one of the first level

storage units and contains one or more volumes for storing data used by the computer. See Clifton column 1 line 63 to column 2 line 4.

vv. And a management computer for managing the status of the volumes contained in the first level and the second level storage units, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said one or more first-level storage units. See figure 1 item 18, which shows the mass storage controller.

ww. A management method for managing the volumes contained in the first level and the second level storage units comprising providing volumes in the first level storage units for storing data used by the computer. See Clifton column 1 line 63 to column 2 line 4.

xx. Establishing a hierarchical relationship between one of the first level storage units and one of the second level storage units that allows a volume in said one of the second-level storage units to be made available for use as a volume in said one of the first storage units. See Clifton column 1 line 63 to column 2 line 4.

yy. Issuing a request for volume information from the management computer to the first level and second level storage units. The mass storage controller provides the volume information collecting means (See Clifton column 9 lines 45-52). See also Clifton column 1 lines 21-22, which states that storage management entails monitoring space usage.

- zz. Issuing a request for inter-volume hierarchical information from the management computer to the first-level and the second-level storage units, said hierarchical information identifying which volumes of said second-level storage units and said first-level storage units are hierarchically linked together.
- aaa. Composing, based on the volume information and the inter-volume hierarchical information thus collected, a consolidated information table including an upper volume column containing the identifier, capacity, icon number, a flag indicating the existence of subordinate volumes for each volume belonging to the higher level of hierarchy, and a lower volume column containing the identifier, capacity, and icon number for each volume belonging to the lower level of hierarchy in the management computer. Clifton teaches the use of a MSVI. Clifton column 12 lines 38-40 show that the record identification is stored. Clifton column 12 lines 65-67 show that the storage of information about the space in the volume is stored. It would be obvious to store the other information in this table.
- bbb. Registering the consolidated information table in a memory. As the MSVI is stored, it is inherent that it is registered in a memory.
39. Clifton does not explicitly disclose the use of a identifier format information system to allow the use of storage devices from different manufacturers.
40. Kusters discloses a storage management system with a volume manager that allows multiple storage devices from different manufacturers without the higher level system needing to know the specifics of each device.

41. With respect to claim 23, Kusters teaches:

ccc. Storing in a memory, located in each of the first level and second level storage units, identifier format information in a standardized format for identifying volumes of the first level and the second level storage units respectively. See Kusters column 6 lines 57-63. In order for the volume provider to know how to make a volume, it is necessary for it to have the identifier format information.

ddd. Consulting the identifier format information stored in the memory in each of the first level and second level storage units upon receiving the request for volume information and sending to the management computer the volume information including the number of volumes contained in it, their identifiers and their capacities in the format specified in the identifier format information. In order to return the requested information, it is inherent that the information would be returned in a way that is consistent with the API of the system.

42. Clifton and Kusters are analogous art because they are from the same field of endeavor, the design of data storage systems.

43. At the time of the invention it would have been obvious to a person of ordinary skill in the art to use the system disclosed by Kusters to allow hardware having different lower level structures in the hierarchical storage system of Clifton.

44. The motivation for doing so would have been to allow the use of different types and manufacturers of storage units with the same application programming interface (Kusters column 2 lines 34-39), which makes the lower level details of the system more

transparent to users allowing the entire storage system to appear to users as a plurality of disk drives all directly available to the host computer (Clifton column 2 lines 54-56).

45. Although Clifton and Kusters teach a hierarchical storage system and management method that provides a layer of abstraction between the lower level details of the storage devices and the interface the higher level system uses to communicate with the storage system, they do not address the use of a display for monitoring and managing such a system.

46. Prahlad teaches the use of a graphical display to browse and manage a hierarchically related storage system.

47. With respect to claim 23, Prahlad teaches:

eee. Displaying the contents of the consolidated information table retrieved from the memory in at least three display sections of the display: a display section for displaying the identifiers, capacities, and associated icons of the volumes belonging to the higher level of hierarchy, a display section for displaying the identifiers, capacities, and associated icons of the volumes belonging to the lower level of hierarchy, and a display section for displaying the total available capacity. The display of these elements is taught by Prahlad in paragraph 0076.

Separating the elements of the storage system into separate sections for display would be obvious to one of ordinary skill in the art.

48. Clifton, Kusters and Prahlaad are analogous art as they are from the same field of endeavor, namely the design and management of storage systems having hierarchical relationships.

49. At the time of the invention it would have been obvious to a person of ordinary skill in the art, having the teachings of Clifton, Kusters and Prahlaad before them, to use a display system similar to that of Prahlaad to visualize and interact with the storage management system.

50. The motivation for doing so would be to create an easy to use method for controlling the grouping of volumes (Clifton column 11 lines 27-30). It is well known in the art of computing to use a graphical user interface to view and control aspects of storage devices.

Therefore it would have been obvious to combine a graphical user interface such as the one taught by Prahlaad to monitor and control the storage system of Clifton to obtain the invention as specified in claim 23.

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

2. **Claim 1** is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of copending Application No. 10/811,868. Although the conflicting claims are not identical, they are not patentably distinct from each other because the difference between the two is the recitation in Application No. 10/811,868 that the data storage apparatuses are connected through a first network to computers. The connection of a storage system to a plurality of computers over a network is well known to one of ordinary skill in the art, and is also shown in figure 1 of the instant application.

Instant Application 10/768,108	Application 10/811,868
1. A computer system comprising a computer, a plurality of storage units each containing one or more volumes for storing data used by the computer And a management computer for managing the status of the plurality of storage units comprising	1. A management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, said management computer comprising
One or more first level storage units each containing one or more volumes for storing data used by the computer	"wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned"
One or more second level storage units each of which is connected through a communication path to,	<i>This limitation shows that data storage apparatuses are connected hierarchically. This hierarchical</i>

and hierarchically linked to one of the first level storage units and contains one or more volumes for storing data used by the computer, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said one or more first-level storage units.	<i>connection creates first and second level storage units.</i>
Volume information collecting means for collecting information on the volumes contained in the first level and second level storage units	A storage area information collecting module which collects respective pieces of storage area information from said data storage apparatuses connected through the second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned
Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes contained in the first level storage units, said information on the hierarchical relationships identifying which volumes of said second-level storage units and said first-level storage units are hierarchically linked together and	A hierarchy information collecting module which collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned and
Effective capacity calculating means for calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on the volume information and the hierarchical information thus collected.	A management relation information creation module which sets hierarchy among said data storage apparatuses to create management relation information, based on said pieces of storage area information collected in said storage area information collecting module

3. **Claim 9** is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 8 of copending Application No. 10/811,868. Although the conflicting claims are not identical, they are not patentably distinct from each other. The first difference between the two is the recitation in Application No. 10/811,868 that the data storage apparatuses are connected through a first network to computers. The connection of a storage system to a plurality of computers over a network is well known to one of ordinary skill in the art, and is also shown in figure 1 of the instant application. The second difference is that it is specified that an arithmetic unit of the management computer performs the actions specified in the claim in Application No. 10/811,868, while the actions in the instant application are performed by code executed by the management computer. It is well known to one of ordinary skill in the art that code is executed by a CPU, which is an arithmetic unit and a integral part of a computer.

Instant Application 10/768,108	Application 10/811,868
9. A management computer for managing the status of storage units containing volumes for storing data used by a computer, comprising	A management computer connected through a second network to data storage apparatuses that are connected to computers through a first network, wherein; said management computer comprises an arithmetic unit and a memory; and said arithmetic unit;

<p>Volume information collecting means for collecting information on the volumes from one or more first-level storage units containing volumes for storing data used by the computer, and from one or more second-level storage units each of which is connected through a communication path to, and hierarchically linked to, one of the first-level storage units and contains at least one volume for storing data used by the computer, wherein as hierarchically linked, said one or more second-level storage units have a volume that is available for use as a volume in one of said one or more first-level storage units</p>	<p>collects respective pieces of storage area information from said data storage apparatuses connected through said second network, wherein each piece of storage area information relates to storage areas provided by a data storage apparatus concerned;</p>
<p>Hierarchical information collecting means for collecting information on the hierarchical relationships between volumes in the first-level storage units and volumes in the second-level storage units, said information on the hierarchical relationships identifying which volumes of said second-level storage units and first-level storage units are hierarchically linked together</p>	<p>collects respective pieces of hierarchy information from said data storage apparatuses connected through said second network, wherein each piece of hierarchy information indicates hierarchy among data storage apparatuses held by a data storage apparatus concerned;</p>
<p><i>It is inherent that if the hierarchy information is collected that it has been set.</i></p>	<p>sets hierarchy among said data storage apparatuses to create management relation information, based on said pieces of storage area information and said pieces of hierarchy information</p>

<p>Effective capacity calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on the volume information and the hierarchical information thus collected.</p> <p><i>It is inherent that if a value is calculated by a CPU, it will be stored in a memory and returned to the entity that caused its calculation.</i></p>	<p>and of storing the created management relation information into said memory; and outputs said management relation information stored in said memory.</p>
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Response to Arguments

51. Applicant's arguments filed on 10/4/2005 have been fully considered by the examiner. These arguments have been found to be partially persuasive as discussed in detail below.

52. Page 20 paragraph 4 states that the title of the application has been amended and the formatting of the claims have been improved. These amendments are sufficient to overcome the examiner's objections to the specification, and said objections have been withdrawn.

53. Page 21 paragraph 1 through page 24 paragraph 2 address the examiner's rejection of claims 8 and 19-23 under USC 112 first paragraph. This explanation of the meaning of identifier in combination to the amendments made to said claims are

sufficient to overcome the examiner's rejection of said claims under USC 112 first paragraph, and this rejection has been withdrawn.

54. Page 24 paragraph 3 addresses the rejection of claims 8-14 and 19-23 under 112 second paragraph. The amendments to said claims are sufficient to overcome the examiner's rejection of these claims and the rejection is accordingly withdrawn.

55. Page 25 paragraph 1 addressed the examiner's rejection of claims 9 and 17 under USC 101. The amendments to said claims are sufficient to overcome the examiner's rejection of these claims and the rejection is accordingly withdrawn.

56. Page 25 paragraph 2 through page 28 paragraph attempt to traverse the examiner's rejection of claims 1-5, 9, 15, 18, and 24 under USC 102 (b). The examiner respectfully disagrees and directs Applicant to the clarified rejection under USC 102 (b) supra. Additionally, the examiner will address Applicant's arguments and explain why the arguments are not persuasive.

57. In the third paragraph of page 25, Applicant argues that the terms "computer system", "storage units", "volumes", "status", "hierarchy", "collection", "information", and "capacity" have not been interpreted in light of the specification. However, as the examiner does not know of a specific definition for these terms provided in the specification, and the Applicant does not make reference to a specific definition, the examiner has given these terms their ordinary meaning to one of ordinary skill in the art.

58. In the second paragraph of page 26, Applicant argues that Clifton does not teach a hierarchical link between volumes in the first and second level storage units. The examiner respectfully disagrees.

59. The volumes held in the second-level storage units are available for use as a volume in one of the first-level storage units. By transferring the data from the second level storage units to a first level storage unit, the volumes are able to then be used as a volume in the first level storage unit. The first level storage units are used in a manner similar to a cache for the second level storage units, which is well known to be a hierarchical memory structure.

60. Additionally, the examiner directs Applicant to column 1 line 63-64 of Clifton, which states "The mass storage system is a hierarchical system in which data is available at one of three levels." See also column 2 lines 54-65 that shows that the mass storage system appears to the host computer as a plurality of disk drives directly available to the host.

61. Column 12 lines 58-60 of Clifton shows that the serial number of the cartridges in the library are associated with the volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table

62. In the first paragraph of page 27, Applicant argues Clifton does not suggest means for collecting information on the hierarchical relationships between volumes in the first and second level storage units. The examiner respectfully disagrees. As stated supra, this information is collected by the system and stored in the MSVI table. The information collected indicates the relationship between volumes in the first and second level storage units by associating the number of the cartridge containing the volume in the mass storage facility with the associated volume stored in the DASD.

63. In the second paragraph of page 28, Applicant questions the examiner's statement of inherency with respect to the calculation of the effective capacity of the mass storage system. However, Applicant does not state any argument as to why the statement of inherency is false. Applicant additionally argues that the effective capacity is not calculated "based on the volume information and the hierarchical information thus collected. The examiner respectfully disagrees and directs Applicant to the rejection *supra*. The examiner further points out that the hierarchical information collected allows the system to calculate the effective capacity of the DASD, and the volume information provides the number of volumes in the mass storage system, allowing the calculation of the effective capacity of the mass storage system.

64. In paragraph 1 of page 29, Applicant argues that Clifton does not teach means for storing information on the hierarchical relationships as recited in claim 3. The examiner respectfully disagrees. Column 12 lines 58-60 of Custer shows that the serial number of the cartridges in the library are associated with the volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table.

65. In paragraph 1 of page 30, Applicant argues that Clifton does not teach identifiers associated with volumes in the first level storage units. The examiner respectfully disagrees, and refers Applicant to the rejection *supra*. Column 12 lines 58-60 of Custer shows that the serial number of the cartridges in the library are associated with the volume transferred to the first level storage unit. This identifies the hierarchical link between volumes and is collected by the system and is stored in the MSVI table.

66. In paragraph 3 of page 30, Applicant argues that Prahlad does not teach any display of information relating to hierarchically-linked storage devices. The examiner respectfully disagrees, and directs Applicant to the rejection of claim 14 *supra*.

67. In paragraph 2 of page 31, Applicant argues that Kusters does not teach the use of an identifier. The examiner respectfully disagrees, and directs Applicant to the rejection *supra*.

68. In paragraph 3 of page 31, Applicant argues that Kusters does not teach that the identifier management computer does not provide the identifier format to the management computer or storage units upon request. The examiner respectfully disagrees. Although Kusters does not expressly teach the storage units requesting the identifier format from the management computer, the storage units clearly are capable of making such a request, and thus are means for inquiring the identifier format of the identifier management computer. Kusters column 8 lines 37-41 show that the common volume manager provides the globally unique identifier. The examiner additionally directs Applicant to the rejection *supra*.

69. In paragraph 2 of page 32, Applicant argues that claims 1 and 9 have been amended to distinguish said claims from claims 1 and 8 of copending Application No. 10/811,868. The examiner respectfully disagrees. The amendments to claims 1 and 9 have done little to affect the scope of said claims, merely clarifying the definition of terms used within said claims. As such, the provisional rejection of double patenting is not withdrawn.

Conclusion

70. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jared I. Rutz whose telephone number is (571) 272-5535. The examiner can normally be reached on M-F 8:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald Sparks can be reached on (571) 272-4201. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2187

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Jared I Rutz
Examiner
Art Unit 2187

jir JIR


CHRISTIAN CHACE
PRIMARY EXAMINER